VersaMax Mixed Discrete / High-Speed Counter Module

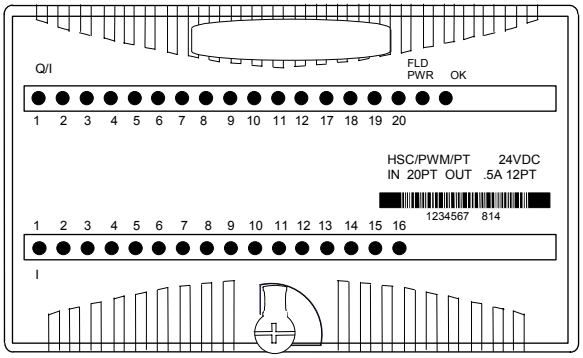
April 2009 GFK-1561F

Product Description

The VersaMax Mixed Discrete High-Speed Counter module, IC200MDD841, has twenty 24VDC positive-logic type inputs and twelve positive-logic 24VDC 0.5Amp outputs.

In its default configuration, the module provides four Type A high-speed counter inputs and outputs plus twelve standard inputs and eight standard outputs.

Each counter provides direct processing of rapid pulse signals up to 80KHz for industrial control applications such as velocity measurement, material handling, and process control.



The module's inputs and outputs can be re-configured for a wide variety of applications:

- The high-speed counter inputs can be set up as standard high-speed inputs, as four type A counters, as two type A counters plus one A-quad-B counter, or as one type A-quad-B counter with homing capability.
- Four of the outputs can be configured as pulse-width modulated (PWM), pulse train, ramping pulse train, or high speed counter outputs.

When configured for PWM operation, the frequency of each PWM output is selectable in the range of 22Hz to 2KHz. The duty cycle of each PWM output can be set from 1 to 100% depending on the frequency of the PWM output. See the Minimum % Duty Cycle vs. PWM Output Frequency graph in the *I/O Modules Manual.*

When configured as pulse train or ramping pulse train outputs, the sum of frequencies may be up to 5,000 pulses per second. Acceleration and deceleration can be selected from 10 to 1,000,000 p/s^2.

Power for module operation comes from the backplane. Output devices must be powered by external voltage.

LED Indicators

Individual green field-side LEDs show the on/off status of each point. The green FLD PWR LED indicates the presence of field power for the DC outputs.

The OK LED indicates module status.

- On green indicates normal operation.
- Flashing green indicates boot mode or update
- On Amber indicates self diagnostic error
- Off indicates no 3.3V power present.

Module Characteristics	
Points	20 DC inputs & 12 DC outputs
Module ID	FFFF9801
Isolation: User I/O to logic (optical) and to frame ground Point to point	 250VAC continuous, 1500VAC for 1 minute 250VAC continuous, 1500VAC for 1 minute
Backplane current consumption	3.3V output: 130mA, 5V output: 30mA
External power supply	+24VDC nominal, +18 to +30VDC
Thermal Derating	The number of points that can be on at the same time depends on the ambient temperature, voltage, and the type of carrier on which the module is installed. To meet thermal specifications, the module must be installed on a horizontal DIN rail. There is no thermal derating at 24VDC for ambient temperatures up to 42 deg. C, or at 30VDC for ambients up to 26 deg. C. For derating curves at higher ambients, see the *I/O Modules User's Manual.*
High Speed Channels	
Input frequency	80kHz maximum
PWM Output frequency	2 KHz maximum
Pulse Output frequency	5 KHz maximum
Counter Output latency	0.5mS max. between output point updates
Input Characteristics	
Input voltage	+24VDC nominal, 0 to +30VDC
On state voltage Off state voltage	+15.0 to +30.0VDC 0 to +5.0 VDC
On state current Off state current	3.0 to 8.0mA 0 to 0.5mA
On/off response time	7.0ms max. (6.25μs max. for count inputs and 100μs for Preload/Strobe inputs)
Count Input Impedance	6.6kOhms maximum
Count User input current	5.5mA at +24VDC
Standard Input Impedance	9.6kOhms maximum
Standard User input current	4.0mA at +24VDC
Output Characteristics	
Inrush current	2.0A maximum for 100ms
Continuous Load Current	0.5A maximum
Output voltage drop	0.3V maximum
On/off response time	500μs, maximum
Protection	no internal fuses
Diagnostics	13 words of status data

Preinstallation Check

Carefully inspect all shipping containers for damage. If any equipment is damaged, notify the delivery service immediately. Save the damaged shipping container for inspection by the delivery service. After unpacking the equipment, record all serial numbers. Save the shipping containers and packing material in case it is necessary to transport or ship any part of the system.

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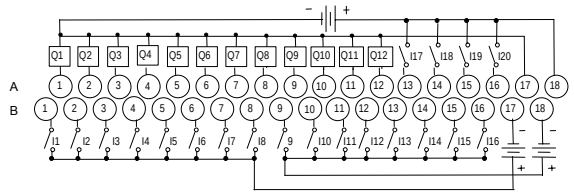
Field Wiring Terminals

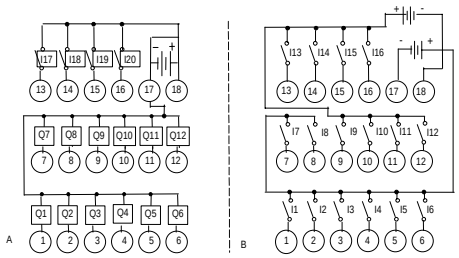
#	4 Type A Counters	2 Type A & 1 Type B	1 Type B2
A1	Counter 1 Output/PWM/PT1	Output 1/PWM/PT1	Output 1/PWM/PT1
A2	Counter 2 Output/PWM/PT2	Type B Counter 2 out/PWM/PT2	Type B2 Counter 2 out/PWM/PT2
A3	Counter 3 Output/PWM/PT3	Type A Counter Output/PWM/PT3	Output 3/PWM/PT3
A4	Counter 4 Output/PWM/PT4	Type A Counter Output/PWM/PT4	Output 4/PWM/PT4
A5	Output 5		
A6	Output 6		
A7	Output 7		
A8	Output 8		
A9	Output 9		
A10	Output 10		
A11	Output 11		
A12	Output 12		
A13	Input 17		
A14	Input 18		
A15	Input 19		
A16	Input 20		
A17	DC- for outputs 1-12 and inputs 17-20		
A18	DC+ for outputs		
B1	Count1	Type B: Phase 2	Type B2: Phase 2
B2	Preload/Strobe 1	not used	not used
B3	Count2	Type B: Phase 1	Type B2: Phase 1
B4	Preload/Strobe 2	Type B: Preload/Strobe	Type B2: Preload/Strobe
B5	Count3	Type A: Count	not used
B6	Preload/Strobe3	Type A: Preload/Strobe	Home Enable
B7	Count4	Type A: Count	not used
B8	Preload/Strobe 4	Type A: Preload/Strobe	Marker
B9	Input 9		
B10	Input 10		
B11	Input 11		
B12	Input 12		
B13	Input 13		
B14	Input 14		
B15	Input 15		
B16	Input 16		
B17	DC- Common for inputs 1- 8		
B18	DC- Common for inputs 9-16		

Note: Because of the fast response time of inputs 1-8, shielded cable properly-terminated at earth ground must be used for connecting to this input group in order to meet IEC 1000-4-4.

Wiring Connections for Carriers with Two Rows of Terminals



Wiring Connections for Carriers with Three Rows of Terminals



Product Description

Firmware version:	1.21
Firmware upgrades:	All applications that use the Counts per Timebase register should be upgraded using upgrade kit 44A748026-G03. The upgrade can be downloaded free of charge from GEFanuc.com.

Software Configuration Requirements:

- PLC CPU programming software version 1.5 or later.
- Ethernet NIU EBI001 firmware version 1.0 or later
- Genius NIU GBI001 firmware version 2.0 or later
- Profibus NIU PBI001 firmware version 2.0 or later
- DeviceNet NIU DBI001 firmware version 2.10 or later

Problems Resolved for Release 1.21

- Counts per Timebase registers retain their proper value after a module reset; they do not become negative for one Timebase after a reset.
- Counts per Timebase registers do not become negative if the module was attempting to update the Counts per Timebase value at the same time the count was rolling over from the high limit to the low limit.

Operating Note/Restrictions

- If hot insertion of a module is done improperly, the operation of other modules on the same backplane may be disrupted. See *Installing a Module on a Carrier* in the *VersaMax Modules Manual,* GFK-1504.
- If a small span is configured and on/off presets are set close together, the following minimum limits should be maintained:

For This Count Frequency:	*Minimum Span between On Preset and Off Preset Should Be:*
10KHz	10 counts
5KHz	5 counts
2KHz	2 counts
1KHz	1 count
Less than 1KHz	No gap required

- If the minimum span per count frequency is not maintained, the output LED may flicker.
- Any data placed in %Q or %AQ memory must remain in memory for at least 20 milliseconds.
- If the module is configured for Hold Last State and the watchdog timer in the CPU or NIU that controls it fails, the module Holds Last State briefly, then switches to default values. This is due to the module being reset by the CPU or NIU.
- When using pulse-trains and ramping pulse-trains, the sum of the frequencies of all simultaneously-executing outputs should not exceed 5,000 pulses/second. Exceeding this speed limit could cause the pulse-trains to stop prematurely, or cause the module's watchdog timer to expire.

- The module can perform the "pulse-train with ramp" function on four output channels. However, no more than two should be used simultaneously. If more than two ramps are executed at the same time, one or more of them may terminate before the specified number of pulses have been generated.
- When the module's Output Stop Mode is configured for Hold Last State, the outputs will only respond in Stop mode if the Enable HSC/PWM/Pulse Train Output %Q bits are still set. These bits will remain set when the %Q memory is configured for default only when the default value for the bits (%Q21-%Q24) is set to 1 on the "Output Parameters" tab in the modules Hardware configuration. Alternatively, the %Q memory can also be configured to Hold Last State on the "Module Parameters" tab in the Hardware Configuration.

Product Revision History

Rev	Date	Description
IC200MDD841-GF	April 2009	Change of manufacturing location.
IC200MDD841-FF	October 2008	Updated Power Supply OK signal circuitry.
IC200MDD841-EF	April 2005	Improvement to latching mechanism
IC200MDD841-DF	August 2004	Changed to V0 plastic for module housing.
IC200MDD841-CF	June 2004	Firmware version 1.21
IC200MDD841-CE	January 2004	ATEX approval for Group 2 Category 3 applications.
IC200MDD841-CE	October 2003	Improved noise immunity
IC200MDD841-BE	June 2003	Firmware version 1.20
IC200MDD841-AD	July 1999	Firmware version 1.10
IC200MDD841-AC	March 1999	Initial product release. Firmware version 1.03

Default Operation

Inputs 1 - 8 are one group of high-speed counter inputs. These inputs operate as:

- Four Type A counters.
- Each counter counts upward.
- When a counter reaches its upper limit, it wraps around and starts over.

Inputs 9 - 16 are one group of standard inputs with a common return.

Inputs 17 - 20 are one group of standard inputs with a common return.

Four of the outputs are High-speed Counter outputs. Each High-speed Counter output is dedicated to a corresponding High-speed Counter input.

Eight additional outputs are standard outputs.

The counter outputs use a default ON preset of +32,767, and an OFF preset of 0. If the count reaches the ON preset, the counter's output is turned on. If the count reaches the OFF preset, the counter's output is turned OFF.

When the system is in Stop mode, the High-speed Counter outputs continue to respond to the counter inputs and the standard outputs turn off. The output presets continue to operate as if the CPU/NIU were present, changing state to reflect the counter Accumulators.

In default mode, the module can temporarily change this basic operation in response to up to four commands from the CPU or NIU. These commands can be sent to the module in its regular output data.

- Each counter output can be turned on or off on command.
- Each counter can be reset to 0.
- Each counter's accumulator (current count) register can be loaded with any value from -32768 to 32767.
- Each counter's lower and upper limits can be changed.
- Each counter's accumulator can be incremented by a specific amount above its present actual value.
- The count direction can be changed to down (or back to up).
- The timebase for each counter's counts-per-timebase, which measures its rate of counting, can be changed from1000mS to any value from 10mS to 65530mS.
- Each counter's preload value can be changed.

Configurable Features

The default parameters of this module can be used in many applications. The module can be software-configured when it is installed in a PLC system, or an I/O Station controlled by a Network Interface Unit that supports software configuration.

The module is configured at startup. After configuration, the module begins providing signals from the voltage or current output devices connected to it to the CPU or NIU.

Parameter	*Description*	*Default*	*Setting /Value Range*
Counter Type	Specifies the counter configuration.	4 Type A	4 Type A counters, 1 Type B & 1 Type A, 1 Type B2
Output Stop Mode	Defines what outputs do if the system is in stop mode. *Normal* means that HSC outputs continue to respond to the counter inputs and standard outputs turn off. Preset outputs, continue to operate as if the CPU/NIU were present, changing state to reflect the counter Accumulators. *Force Off* means all Preset outputs are turned off and remain off until the CPU/NIU returns to normal operation. *Hold Last* means Preset outputs retain current levels and do not reflect the counter Accumulators.	Normal	Normal, Force All Outputs Off, Hold
Channel #1/2/3/4 Function	Specifies channel function.	HSC	HSC, PWM, Pulse Train, Standard, Ramp
Counter Output #1/2/3/4 Enable	Specifies if the counter output is enabled. If disabled, the output is used as a standard output.	Enabled	Enabled, Disabled
Counter #1/2/3/4 Direction	(Type A only). Specifies whether count inputs increment or decrement the accumulator.	Up	Up, Down
Counter #1/2/3/4 Mode	Defines whether the counter wraps if the count limit is reached (continuous) or if it stops at the counter limit.	Continuous	Continuous , Single Shot
Counter #1/2/3/4 Preload/Strobe Selection	Specifies the function of the Preload/Strobe Input.	Preload	Preload, Strobe
Counter #1/2/3/4 Count Input Edge for Type A	For Type A counters only, specifies which transition of this input is used. Positive is a low-to-high transition.	Positive	Positive, Negative. Type B and B2 always positive.
Time Base #1/2/3/4	Specifies the timebase for the Counts-per-Timebase register.	1000mS	10mS to 65530mS
High Limit #1/2/3/4	Defines the counter's upper limit. It must be greater than the low limit	+32,767	-32,767 to +32,767
Low Limit #1/2/3/4	Defines the counter's lower limit.	0	-32,768 to +32,766
ON Preset #1/2/3/4	Defines the counter's ON preset.	+32,767	-32,768 to +32,767
OFF Preset #1/2/3/4	Defines the counter's OFF preset.	0	-32,768 to +32,767
Preload Register #1/2/3/4	This register value is the Preload value for the counter.	0	-32,768 to +32,767
Home Value	The Home Value for the counter.	0	-32,768 to +32,767
Acceleration	Pulse Train acceleration rate from stop to full speed.	1,000,000	10 to 1,000,000
Deceleration	Pulse Train deceleration rate from full speed to stop.	1,000,000	10 to 1,000,000

Module Data

The module provides 40 bits of bit input data and 13 words of word input data. This data contains standard inputs, status bits, and the contents of module registers such as the counts-per-timebase and accumulators for each counter.

Bit Inputs (%I)	1 - 20	Standard Inputs #1 to #20
	21 - 24	Strobe Status #1 to 4
	25 - 28	Preload Status #1 to 4
	29 - 32	HSC Output Status #1 to 4
	33 - 36	Pulse Train Complete #1 to 4
	37	Home Complete
	38 - 39	reserved
	40	Status code present in Word Input 1
Word Inputs (%AI)	1	Module Status Code, which indicates specific errors in the content of the data commands.
	2 - 5	Counts-per-Timebase #1 to 4.
	6	Accumulator register #1.
	7	Strobe register #1.
	8	Accumulator register #2.
	9	Strobe register #2.
	10	Accumulator register #3.
	11	Strobe register #3.
	12	Accumulator register #4.
	13	Strobe register #4.

The module receives 32 bits of bit output data and 20 words of word output data. The output bits and output words 1 through 8 are the basic module outputs. Output words 9-20 can be used to send up to four commands to the module that temporarily change module operation. These commands are listed at right

Bit Outputs (%Q)	1 - 12	Standard Outputs #1 to #12
	13 - 16	Clear Strobe Status Bit #1 to 4
	17 - 20	Clear Preload Status Bit #1 to 4
	21 - 24	Enable HSC/PWM/Pulse Train Output #1 to 4
	25 - 28	Start Pulse Train #1 to 4
	29	Home Start
	30 - 31	reserved
	32	Clear Module Status bit
Word Outputs (%AQ)	1	PWM/Pulse Train Frequency #1. PWM output frequency range: 22Hz to 2KHz. Pulse Train pulse frequency range: 1Hz to 5kHz.
	2	PWM Duty Cycle/Number of Pulses #1. PWM duty cycle range: see graph in *I/O Modules Manual*
	3	PWM/Pulse Train Frequency #2.
	4	PWM Duty Cycle/Number of Pulses #2.
	5	PWM/Pulse Train Frequency #3.
	6	PWM Duty Cycle/Number of Pulses #3.
	7	PWM/Pulse Train Frequency #4.
	8	PWM Duty Cycle/Number of Pulses #4.
	9 - 11	Command 1, words 1 to 3.
	12-14	Command 2, words 1 to 3
	15-17	Command 3, words 1 to 3
	18-20	Command 4, words 1 to 3

Data Commands

Data Commands can be used to temporarily change the counter parameters listed below. There is no limit to the length of time a command can be present in the output words. The module acts on a command only when it detects a change in the command words. However, these changes are lost when the module is powered down and when a new configuration is stored fom the programmer.

Data Commands can be sent to the module as part of its analog (AQ) data. When the module is installed in a PLC, the PLC CPU can also send Data Commands using the COMREQ function.

Load Accumulator	Loads any value within a counter's limits directly into the Accumulator.
Load High Limit Load Low Limit	Sets the High and Low limit to any value in the counter range.
Load Accumulator Increment	Offsets a counter Accumulator by up to +127 or –128 counts. This can be done at any time, even while the counter is counting at maximum rate.
Set Counter Direction	(Type A only) Changes the count direction of a type A counter.
Load Timebase	Changes the time interval used for the counts/timebase word data. The range is 10 to 1000mS in 10mS intervals.
Load Home Value	Changes the home value for the Type B2 counter.
Load ON Preset	Sets up the output turn on points within the counter range. There is one output associated with each counter.
Load OFF Preset	Sets up the output turn off points within the counter range.
Load Preload	Changes the count value loaded into the counter Accumulator when the Preload input is activated.
Load Stop Mode (or Resume Decelerate Mode)	Changes a Pulse Train output's deceleration to stop the Ramp immediately when the Output Enable bit goes Off. The Ramp function must be enabled. The same command can be used to reset the output to Decelerate mode.
Load Acceleration	Changes a Pulse Train output's acceleration. The Ramp function must be enabled. Both acceleration and deceleration can be selected from the range of 10 p/s^2 to 1,000,000 p/s^2. The default for both is 1,000,000.
Load Deceleration	If the Ramp function is enabled, this command changes a Pulse Train output's deceleration.
Load Correction	Sets the change (in microseconds) that should be applied to the duty cycle of a Pulse Train output. The range is 0 to 200 microseconds.

Installation in Hazardous Locations

- EQUIPMENT LABELED WITH REFERENCE TO CLASS I, GROUPS A, B, C & D, DIV. 2 HAZARDOUS LOCATIONS IS SUITABLE FOR USE IN CLASS I, DIVISION 2, GROUPS A, B, C, D OR NON-HAZARDOUS LOCATIONS ONLY
- WARNING - EXPLOSION HAZARD - SUBSTITUTION OF COMPONENTS MAY IMPAIR SUITABILITY FOR CLASS I, DIVISION 2;
- WARNING - EXPLOSION HAZARD - WHEN IN HAZARDOUS LOCATIONS, TURN OFF POWER BEFORE REPLACING OR WIRING MODULES; AND
- WARNING - EXPLOSION HAZARD - DO NOT DISCONNECT EQUIPMENT UNLESS POWER HAS BEEN SWITCHED OFF OR THE AREA IS KNOWN TO BE NONHAZARDOUS